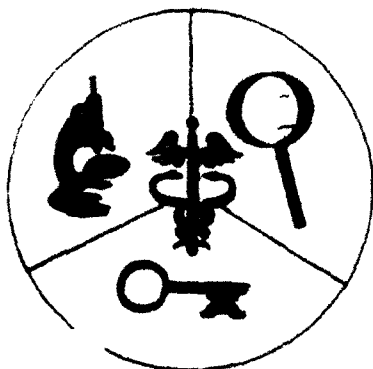


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DIRECTORATE OF
HEALTH CARE STUDIES
AND CLINICAL INVESTIGATION

DEVELOPMENT AND EVALUATION OF A SUCCESS INDEX
FOR PROFESSIONALS
IN POSTGRADUATE TRAINING PROGRAMS

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EXECUTIVE SUMMARY

Background

In 1992, the American Association of Dental Schools (AADS) issued a resolution calling for the development of programs that, by the year 2000, would require all U.S. dental school graduates to enroll in a one-year postdoctoral training program. If the resolution to require postdoctoral Advanced Education in General Dentistry (AEGD) is adopted, the Army will be forced to choose between continuing its existing programs or acquiring only civilian-trained dentists. Budgetary constraints, the value of the existing programs to the military, and consequences of the choice must all be considered.

Recently, concerns have been raised that not enough qualified applicants have applied for the Army's AEGD program and, consequently, accessions from the lower half of dental school classes have had to be selected to fill existing positions. Program mentors have also expressed concern that recent participants have not been performing as well as past participants, presumably because of their lower academic qualifications.

As part of the Army Medical Department Studies Program, the Dental Studies Division of the Health Care Studies and Clinical Investigation Activity initiated a study to examine factors associated with success in the Army-sponsored AEGD program and to determine the likelihood that new accessions with lower dental school class standings would succeed in the AEGD program.

This report provides the Army Dental Care System leadership with a framework for evaluating the existing AEGD selection process.

Methods

This study has two components: 1) the creation of a measure of the dimensions of performance during the AEGD, i.e. an index of program success, and 2) the identification of background factors that are valid predictors of success in the AEGD program.

Academic Evaluation Reports for 25 recent AEGD graduates were analyzed for content by two experienced dental officers. The important dimensions of the AEGD program were established, and rating principles and scales were developed for reviewers to use when evaluating a participants' Academic Evaluation Report. This resulted in 1) definitions of the important dimensions of the AEGD program; 2) summary principles that highlight characteristics to look for when determining the level of achievement demonstrated within the content of the evaluation; and 3) numerical equivalents that allow the accomplishments within each dimension to be translated into quantitative indices of success. The reliabilities of the reviewers' ratings were estimated using the kappa statistic and percent absolute agreement.

Multivariate regression was applied to evaluate biographical factors from 90 recent AEGD graduates for their association with the created Program Success Index. Logistic regression assessed the usefulness of the background factors in classifying individuals as above average or below average in terms of success in the AEGD program. Additional analyzes examined the effect that dental school class standing had on success in the AEGD program and subsequent success within the Army Dental Corps.

Results

Consensus of the reviewers determined the major dimensions of successful performance in the AEGD program; these were then utilized to create a Program Success Index. Background factors available to selection panels were related to the Program Success Index; prior military education, dental school class standing, graduation age, a Regular Army appointment, and an interaction term (prior military education with age at graduation) emerged as significant predictors of success in the AEGD program. These factors accounted for approximately 21 percent of the variation in Program Success Index scores.

In a logistic regression model, the identified predictors correctly classified 67.8 percent of the AEGD participants as either above or below average in terms of success in the program. And, in this model, AEGD participants from the top half of their dental school class were 1.55 times as likely to be classified as above average in terms of program success than were those from the bottom half.

Class standing by itself did not effect the Program Success Index score or subsequent success in an Army career as measured by Officer Evaluation Reports, promotion to the rank of major, or selection for advanced dental specialty education.

Conclusion

The primary value of the approach used in this study is in helping to further clarify the nature of success in AEGD through the development of the Program Success Index. This study suggests that the dimensions of success in AEGD uncovered in the analysis of the Academic Evaluation Report can be reliably quantified by experienced reviewers and can serve as a

framework for establishing evaluative criteria for AEGD programs. The results suggest that while background factors used by selection committees can distinguish between levels of success in an AEGD program, other factors should be considered. This study also showed that dental school class standing, by itself, is of little practical significance as a tool for selecting AEGD participants. In addition, the results of this study do not support the concerns voiced by program mentors that AEGD performance has diminished over time.

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Introduction and Overview

Purpose

This report presents the results of a 1992 study initiated to examine factors associated with success in the one year Advanced Education in General Dentistry (AEGD) Program sponsored by the U.S. Army Dental Corps and to determine how well new accessions with lower dental school class standings will be likely to succeed in the AEGD residency. This report provides the Army Dental Care System leadership with information and a framework for evaluating the existing AEGD selection process.

Background

Trends in the practice of general dentistry dictate the need for proficiency in all the clinical disciplines (1). A one-year postdoctoral AEGD program can provide recent graduates with the opportunity to increase their knowledge in all disciplines and to develop speed, confidence, and advanced techniques under faculty supervision (2). Accredited AEGD programs have expanded significantly; from 1981 to 1986 their numbers increased from 4 to 31. Forty-two percent of these programs were sponsored by the federal dental services (3).

The American Association of Dental Schools (AADS) Task Force on Advanced Education and the American Dental Association (ADA) Special Committee on the Future of Dentistry in the 1980s have recommended support for postdoctoral education programs in general dentistry (4). In 1987, the AADS Council of Hospitals sponsored a

symposium to discuss concepts and present practical approaches related to implementing required postdoctoral education programs in general dentistry for all dental school graduates (4). At the 1992 annual meeting of the AADS, Resolution 11 called for the continuing development of postdoctoral programs in general dentistry so that by the year 2000, all graduates of U.S. dental schools will be required to enroll in one year of postdoctoral training (5). However, until a consensus of support is reached among appropriate licensing bodies, policy makers, educators, practitioners, and sponsors of programs, the debate surrounding this resolution for a postdoctoral education program in general dentistry is likely to continue.

AEGD and the US Army Dental Corps

Such innovations that are evolving at the national level, will have a profound impact upon the Army's postdoctoral programs. If the proposed resolution requiring postdoctoral AEGD is adopted, the Army will be faced with choosing to continue its existing programs or to acquire civilian-trained new dentists. This complex choice will have to be evaluated in terms of current budgetary constraints, the importance of the programs to the military, and consequences of the choice. For the purposes of this paper, it is assumed that a continuation of existing AEGD programs will be the Army's choice.

Given this choice, what selection criteria will the Army employ to ensure that the best possible applicants are selected for its

Army's AEGD program? Will the current selection process for AEGD remain intact or will it be modified? These are questions for the Army Dental Care System leaders..ip and will require further study.

Traditionally, the Army's selection process for AEGD has involved a review of an applicant's qualifications by a selection board composed of senior dental officers. Information available to the board usually consists of background information such as age, gender, dental school attended, class rank in dental school, transcripts, a history of prior military service, and letters of recommendation. The board then ranks applicants and offers AEGD positions based on that ranking.

In recent years, because of fewer applicants, the Army has had to select a number of individuals with dental school standing below the class mid-point. In addition, program mentors have expressed concern that recent Army AEGD participants have not been performing as well as residents did in the past. Presumably this is because of the new residents' poorer academic performance in dental school. These concerns were clearly demonstrated in the selection process for the 1991 and 1992 AEGD classes: only 32 and 40 applicants, respectively, were selected, although there were 42 positions available in 1991 and 48 positions were available in 1992.¹ If the proposed resolution for required postdoctoral AEGD is adopted, it is likely that the additional competition for applicants will

¹Personal communication from Colonel Jon Rampton, Chief, Graduate Dental Education for the US Army Dental Corps, August 1992.

require the Army to accept individuals with even poorer academic credentials.

AEGD Selection Criteria Development

Selection of personnel for an AEGD program is a complex process. One of the problems facing selection boards is how to choose from the applicant pool those candidates most likely to successfully complete the AEGD program of study. The primary question becomes, "Using the available application information, how does a selection board identify those applicants most likely to succeed?"

Ideally, the selection board should begin with clearly formulated criterion-related strategies for evaluating the applicant's potential for success in the AEGD program (6). However, this is usually not the case. The process more often involves the selection board's reviewing available biographical information, prior accomplishments, and demonstrated academic performance to ultimately form an inference about an applicant's probable success in the program. This method of selection is based on the behavioral-consistency model premise that "the best indicator of future performance is past performance"(7). To date, this has not been proven with regard to the selection of applicants for the Army's AEGD program.

Many techniques have been employed for assessment of personnel. One of the most widely used devices has been the biographical inventory, whether as a personal history inventory, an application blank, or even the schedule for a selection interview (8).

Biographical inventories have consistently been shown to provide valid predictors of criteria relevant to organizational success (8). Traditionally, these criteria have been tied to job performance or other occupationally specific measures; and they have involved such diverse constructs as sales success (9), career paths (10), and general career success (8). Hough applied the principle of behavioral consistency and aspects of the biographical inventory to develop and validate the "Accomplishment Record" method for selection, promotion, and performance appraisal of legal professionals (11). Campbell used a combination of hands-on job sample tests, multiple-choice knowledge tests, peer and supervisor ratings, and existing file data to develop criteria to validate both experimental and existing predictors of job performance among entry-level enlisted positions in the U.S. Army (12).

The application of assessment techniques in predicting the success of personnel has not been ignored by the field of dental education. Staat and Yancey used a combination of preprofessional academic records and selected personal characteristics to develop the "Admission Index" in an attempt to improve the predictability of success in the admission process for dental schools (13). Potter and McDonald used structural models to examine the direct impact of the quality of dental school education on future professional performance (14). Scheetz used discriminant analysis to determine if admissions data available to admissions committees was useful in distinguishing between potential graduates and nongraduates of dental schools (15). Westerman assessed

personality preferences as predictors of performance for first-year dental students (16). Simon and Chambers administered a battery of 22 aptitude tests to a national sample of dentists in an attempt to predict success in dental training and in dental career performance (17).

As thorough as the research has been in exploring measures associated with occupational success, very little work involving measures associated with success in postgraduate dental programs has been reported. And, to date, no published research has reported on measures of success for those in postgraduate dental programs or predictors of such success.

Recent studies have utilized outcomes assessment in order to evaluate postgraduate dental programs. Wolf measured the satisfaction of residents who had completed general practice residency programs (18). Handelman and Demby and Burakoff measured the effect of general practice residency training on residents' subsequent practice of dentistry (19,20).

One of the biggest handicaps associated with predicting success is that success is a difficult concept to conceptualize and to define operationally. Assuming that the problems involved in defining and measuring success can be overcome, identifying those biographical and academic factors associated with success in a given program would provide very useful guidelines for the selection of applicants for AEGD.

The present study had two goals: 1) to identify those background factors associated with a person's success in the AEGD program, and

2) to examine the likelihood that new accessions with lower dental school class standings will succeed in the Army's AEGD program. This study accomplishes this by developing a success criterion, i.e., a measure of the major dimensions of performance during AEGD residency, against which factors identified as predictors of success in the AEGD program can be validated.

Methods

Determination of the Dimensions of AEGD Resident Performance

Each U.S. Army AEGD participant receive a formal academic evaluation report, the US Army Officer Evaluation Report (OER) DA Form 67-8, at the end of their program. This provides the opportunity for the AEGD program mentor (rater) and another senior dental officer (senior rater) involved with the program to critically evaluate the AEGD participant in the following respects:

- | | |
|--------------|---|
| The Rater | <ul style="list-style-type: none">• Professionalism• Ability to meet Program Requirements• Comment on Specific Aspects of Performance• Potential for Promotion to Next Highest Rank• Comment on overall Potential |
| Senior Rater | <ul style="list-style-type: none">• Comments on Overall Potential |

This report then becomes part of the participant's Official Military Personnel File which is maintained on centrally located microfiche and is utilized by the Army Dental Corps in determining assignments, promotions, and consideration for further professional training programs.

In an attempt to identify the major dimensions of performance in the AEGD program, 25 anonymous copies of academic evaluation reports, representing 3 different AEGD class cohorts, were obtained from the Army's Office of the Dental Corps Branch. Each academic report was independently reviewed and analyzed for content by three experienced dental officers. Each reviewer subjectively formed preliminary themes of overall accomplishments within the content of

the reports (21). No strict rules were imposed on the three dental officers in the selection of these major themes.

The next phase was a Delphi-type negotiation among the three reviewers wherein they merged their choices into a single list of the major dimensions of performance in AEGD. Information about the choices and the rationale for them was discussed among the three reviewers. As a result of this group discussion, five areas were agreed upon as representative of the dimensions of performance during the AEGD residency. They were designated (a) Institutional Potential, (b) Leadership Potential, (c) Dental-Professional Potential, (d) Academic Performance, and (e) Overall Residency Performance. Criteria were written to define each of these five dimensions.

Development of the AEGD Success Index

The procedures just described yielded the major dimensions of performance by AEGD residents and provided the structure for developing the Success Index for AEGD.

The Army's Office of the Dental Corps Branch provided Academic Evaluation Reports (AERs), along with background biographical information, on a representative sample of recent AEGD graduates (n=90). Appendix A contains a copy of the AER and the Background Biographical Information Data Collection Sheet. Confidentiality of reports and records was maintained throughout the study. AEGD cohorts from 1984 (n=33), 1986 (n=24), and 1987 (n=33) were selected in order to examine applicant selection and

program trends, as well as to create the opportunity to evaluate how measures of success in AEGD translate into career success.

The 90 AERs were reviewed by two experienced senior dental officers. Using a modification of the method developed by Hough (1984), each reviewer was asked to rate the reports in each of the five AEGD program dimensions (11). In each dimension, the AEGD participant was rated on a 0 to 4 ordinal scale with "0" assigned to the lowest and "4" representing the highest level of achievement. Guidelines specifying elements to look for or principles to use when rating the level of achievement within the five program dimensions were given to the two reviewers (see Appendix B for the Evaluation Form and guidelines used).

A rating score on each of the five program dimensions and an overall score, representing the sum of the five individual scores, were tabulated by each reviewer for each AER. The reliabilities of the reviewers' ratings were estimated using the kappa statistic and percent absolute agreement (22). As can be seen in Table 1, the dimensions most reliably rated by the reviewers were dental professional potential and overall residency performance (.80), the dimension least reliably rated was institutional potential (.55), and the median reliability was .72. Fleiss (22) and Landis and Koch (23) have suggested that for interpretation of kappa, 0.40 and below represents poor agreement beyond chance, 0.40-0.75 represents fair to good agreement, and 0.75 and above represents excellent agreement. This analysis suggested that the reviewers had evaluated the AER with sufficient reliability to warrant the use of

the five dimensions in the development of an index of success in AEGD. The t-test statistic was used to compare mean scores by reviewer, across all five dimensions for each of the three year-group cohorts. No statistically significant differences in scoring were detected at the $p < .05$ level.

All scores, totals (called overall success scores) and those for each of the five dimensions, were pooled for the two reviewers. Mean values were calculated and then used as criteria to index success in AEGD. The success criteria measures and descriptions, mean scores, and standard deviations are presented in Table 2. Because it was felt that the five dimensions of success in the AEGD program represent somewhat different but interrelated constructs, principal component analysis was performed to simplify the description of the dimensions. The final one-factor solution (named Program Success) was selected on the basis of the proportion of variance (0.83) explained by the first principal component (24). Table 3 presents the principal component patterns for the five dimensions of success in AEGD. As can be seen in Table 3, no single coefficient distinguished itself as highly correlated with the first principal component. This was interpreted as meaning that the first principal component was reasonably representative of the five, original dimensions, and, thus, was used to express overall success in an AEGD program.

Overview of the AEGD Success Index Development

After the important dimensions of the AEGD program were established, rating principles and scales were developed for reviewers to use when evaluating an AEGD participant's AER. This method resulted in (a) definitions of the important dimensions of the AEGD program; (b) summary principles that highlight key characteristics to look for when determining the level of achievement demonstrated within the content of the evaluation; and (c) numerical equivalents that allow the accomplishments within each dimension to be translated into quantitative indices of success.

Predictors

Although it is acknowledged that many factors potentially influence success in the AEGD program, only those biographical factors available to selection panels were examined. Characteristics of the factors examined appear in Table 4.

Results

Factors Associated with the AEGD Success Index

Simple correlation coefficients between the background factors and the AEGD success index scores are presented in Table 5. A Regular Army appointment ($r=.25$), overall class standing in dental school ($r=.26$), and prior military education ($r=.23$, either in the Reserve Officer Training Corps or at the U.S. Military Academy),

were all significantly and positively correlated with the Program Success Index score.

Multiple stepwise regression analysis, using the Statistical Analysis System[™], was performed to relate all of the background factors described in Table 4 to the Program Success Index scores. The background factors identified were prior military education, dental school class standing, graduation age, a Regular Army appointment, and the interaction term of prior military education with graduation age. The results of the regression analysis are presented in Table 6. The model relating factors from the backgrounds of AEGD participants to the Program Success Index score was statistically significant (F value = 4.42, $p < .0013$), and the linear combination of the factors accounted for 20.83 percent of the variation in the Program Success Index score. This coefficient of multiple determination, R^2 , is comparable to levels reported in other occupationally specific models (8). All of the background factors identified, with the exception of a Regular Army appointment ($p < .0598$), were significant at the $p < .05$ level.

In order to evaluate whether the Overall Success Score (the sum of the five dimensional scores) would yield a higher coefficient of determination than would the principal component score, a multiple regression model using the same background factors was executed. The R^2 value was .2015 (model: F value = 4.241, $p < .0017$) indicating that the simple addition of the dimensional rating scores gives essentially the same results as using the first principal component (Program Success Index score) for this one-

regression comparison. Table 7 presents examples of how changes in the background factors will alter the Overall Success Score.

AEGD Success Based on Class Standing

One of the primary goals of the study was to examine the likelihood that new accessions with lower dental school class standings will succeed in the Army's AEGD program. The model compared AEGD participants who had graduated in the top half of their dental school classes to those who had graduated in the bottom half. Estimates for class standing in Table 6 can be interpreted as follows: compared to those graduating in the bottom half of their class, AEGD participants who graduated in the top half would be expected to have nearly a two-point increase in their estimated Program Success Index score, holding all other variables constant. A similar model, comparing participants in the top one-third of their class with those in the bottom half of their class, failed to establish class standing as a significant factor at the $p < .05$ level, even though the overall regression model was significant (model: F value = 2.945, $p < .0235$, $R^2 = .2691$).

To further examine the effect that dental school class standing had on success in the AEGD program, the t-test statistic was used to compare the mean values of the factors and the Program Success Index scores between AEGD participants in the top half of their graduating dental class ($n=71$) and those in the bottom half ($n=19$). The only significant difference detected between the two groups was in grade point average from dental school (Bottom half: GPA=2.83,

st.dev.=.26, Top half: GPA=3.08, st.dev.=.27, $p < .0004$).

Comparisons of Program Success among Year Groups

Stratification by year group cohort permitted the validation of the concerns voiced by mentors in the AEGD program that the performance of recent AEGD participants was lower than in the past. Differences in mean Program Success scores were examined using analysis of variance (ANOVA) and t-tests for multiple comparisons of mean values. The ANOVA revealed that the mean Program Success scores for the three year groups were not all equal ($F = 3.49$, $p = .0348$). Significant differences were detected between the 1986 and 1987 year groups ($t = 2.45$, $p < .0173$). However, the variances of these two groups were equal ($F = 1.14$, $p < .7486$). No significant differences were detected between the 1984 and 1986 cohorts, or between the 1984 and 1987 cohorts. No clear pattern of decreased performance was evident from the analysis of these three year groups.

Predicting Success among Program Participants

A probit logistic regression analysis was used to assess the usefulness of the predictive factors in classifying individuals as either above average or below average in terms of success in the AEGD program (25). The two levels of success in the AEGD program were arbitrarily defined as above or below the mean Overall Success score. The logistic regression procedure correctly classified 67.8 percent of the AEGD graduates as either successful or as less than

successful (Table 8). Thus, it is evident that this logistic model ($\chi^2=17.96$, $df=5$, $p=.003$), utilizing the identified biographical factors, provided a slightly better than chance probability of correctly classifying participants as above or below average in terms of success in the AEGD program.

Odds ratios were computed comparing the odds of being classified as an above average performer verses a below average performer in terms of program success based on class standing (25). For this model, the odds that someone who graduated in the top half of a class would be classified as being an above average performer were 1.55 times greater (95% Confidence Interval: 1.34, 1.76) than for someone who graduated in the bottom half of a class.

AEGD Success and Career Success

The career progressions of the three year group cohorts were followed from the time of completion of the AEGD program until 1991. The Dental Corps Career Activities Office supplied data from Officer Efficiency Reports (OERs), promotion to the rank of major, and selection for dental specialty training for each of the AEGD graduates. To further examine the effect that dental school class rank and success in the AEGD program had on career success in the Dental Corps, z-approximation tests were performed to compare the proportion of those graduating in the top half of their class with those graduating in the bottom half of their class. The following criteria were used: (a) the proportion receiving top-block ratings on their OERs; (b) the proportion promoted to the rank of major,

ahead of, or with, their peers; and (c) the proportion selected with, or ahead of, their peers for advanced dental specialty training.

Comparing the career success of those graduating in the top half of their dental school class with those graduating in the bottom half, no significant differences were detected for any of the three criteria outlined above. When the AEGD graduates were stratified according to whether they were above or below the mean Overall Success score, no significant differences were detected for the proportion of AEGD graduates who received top-block OER ratings or for the proportion who were selected ahead of, or with, their peers for promotion to major. Significant differences were revealed for the proportion of those selected ahead of their peers for advanced specialty training (.205 = below the mean Overall Success score, .451 = above, $p=.015$); and significant differences were found in regard to overall selection for specialty training between the proportion of those above the mean Overall Success score and those below (above=.608 vs. below=.231, $p=.0001$).

Summary of Results

Consensus among the reviewers determined the major dimensions of performance in the AEGD program. Those dimensions were used to create a one dimensional Program Success Index. Background factors readily available to selection panels were then related to the Program Success Index using an ordinary least squares multiple regression model. Prior military education, dental school class

standing, graduation age, a Regular Army appointment, and an interaction term (combining prior military education with age at graduation) emerged as significant predictors of success in the AEGD program, and these factors accounted for approximately 21 percent of the variation in Program Success Index scores.

In a logistic regression model, the identified predictors correctly classified 67.8 percent of the AEGD participants in terms of success in the AEGD program. And, in this model, AEGD participants from the top half of their dental school class were 1.55 times as likely as those in the lower half to be classified as above average in terms of program success.

Class standing by itself did not affect the Program Success Index score or subsequent career success as measured by OERs, promotion to the rank of major, or selection for advanced dental specialty education.

Discussion

The contribution of this study lies primarily in two areas: it operationally defines success in an AEGD program, and it identifies background, application data that are significantly associated with success in an AEGD program.

Given the relatively little work done in measuring postgraduate dental program success, the issue of the validity of the Program Success Index score needs further elaboration. The use of three "experts" to determine the dimensions of accomplishments inferred from academic reports from AEGD seems consistent with similar methods reported in the literature. Staat and Yancey used mutual agreement from university administrators to develop a formula for the "Admission Index" in the dental school admissions process (13). Hough used three "expert" attorneys to rate the level of achievement demonstrated by law professionals on an "Accomplishment Record Inventory" (11). Peterson used pooled expert judgments of personnel psychologists to enumerate an appropriate list of criterion content categories for making selection and classification decisions for entry-level military personnel (26).

It is interesting that the five dimensions of achievement agreed upon by the experts used in this study fit reasonably well within the four classes of outcome assessment measures (Knowledge Outcomes, Skill Outcomes, Values/Beliefs, and Relationship/Behavioral Measures) of student academic achievement outlined by the American Dental Association Commission on Dental Accreditation (27). The good to excellent reliabilities (Table 1)

of the expert reviewers in this study lend additional support to the validity of the success dimensions.

Another area that deserves discussion relates to the predictor factors identified. When the background application factors traditionally used in the selection process were examined individually, only three of them (a Regular Army appointment, prior military education, and class standing) were even weakly correlated with the Index of Program Success score (Table 5). The overall lack of correlation between these background factors and success in the AEGD program is a pattern consistent with the modest correlations others have reported, especially with regard to the lack of correlation between background admission factors and dental school performance (13,15,28). Similar results have been reported for other professions. Hough reported essentially no correlation between traditional background factors such as honors, grades, Law School Aptitude Test scores, and the bar examination results with the "Accomplishment Record" score developed for selecting and promoting legal professionals (11).

A possible explanation for this lack of correlation is that the AEGD participants used in this study constitute a relatively homogeneous population relative to the precision of the Program Success Index. Graduation from dental school ensures that each AEGD participant has the basic body of knowledge and the clinical skills necessary for minimal success in the clinical curriculum of AEGD. And, as Staat and Yancey observed, predictors have little value in a homogeneous population (13). On the other hand, as the

participants progress through the program, subsequent performance may be influenced by motivation and maturity as Helmreich reported (29). The factors significantly correlated with the Program Success Index (a Regular Army appointment, prior military education, and class standing) discriminate between an otherwise homogeneous population and serve as indicators of motivation for success in the Army and in the AEGD program.

The results of the multiple regression analysis held few surprises given the sample specificity of this statistical technique. With the exception of the interaction term representing those older individuals who had prior military education, all of the identified factors had positive influences on the Program Success Index score. Initially it was thought that older participants with prior military education would exhibit the maturity of age and familiarity with the military system necessary to succeed in the AEGD program. It is possible that these individuals were held to higher performance expectations than those less familiar with the Army and that this effected their overall Success Index scores. However, due to the small number of AEGD participants in this category (n=7), interpretation of this factor's influence must be approached cautiously.

Of the background factors detailed in Table 6, class standing accounted for the greatest amount of explained variance in the regression model (33.6 percent). A Regular Army appointment and graduation age contributed 24 and 19 percent, respectively. As was pointed out above, the amount of variance in the Program

Success Index scores, explained by the linear combination of the identified factors ($R^2 = .2083$), is comparable to the levels reported in other occupationally specific models (8). These results confirm that factors other than those available to selection committees are responsible for much of the variation seen in the patterns of success among AEGD participants.

The usefulness of the predictive factors in classifying individuals as either above average or below average in terms of their success in the AEGD program met with mixed success. Although the probit logistic model successfully classified 67.8 percent of the AEGD participants, this result was interpreted as providing only a slightly better than chance probability. These results were comparable to those of Scheetz, who classified individuals as to the likelihood of graduation from dental school using admissions data readily available to admissions committees (15). Although not directly comparable, the results of this study and those reported by Scheetz have similar explanations, namely, that factors not readily available to selection committees contribute to success within a program.

The results of this study do not support the concerns expressed by the program mentors, i.e., that current or recent AEGD participants have not performed as well as participants have in the past. Even though the ANOVA analysis revealed that mean Program Success scores for the three year groups were not all equal, no significant differences were detected between the 1984 and 1986 cohorts, or between the 1984 and 1987 cohorts. The only detectable

difference was between the 1986 and 1987 year groups and, even then, the variance of mean Program Success scores between these two groups was statistically the same. Further, no significant differences were detected in mean class standing when comparisons were made between the three-year group cohorts. Perhaps the examination of a wider range of year groups would reveal a pattern of decreased performance not revealed in this study.

Thus, for this sample of AEGD participants, dental school class standing was not sufficiently strong as a single predictor of success in the AEGD program, nor were there significant differences in mean class standing between the three cohorts. However, it must be pointed out that when class standing was considered in combination with other background factors, it did make a significant contribution to distinguishing between different levels of success within the program.

The results of this study are not without possible bias. There are many problems inherent in defining and measuring program success. We have chosen to define success in AEGD from only one perspective; that of the mentors, and we have only measured that success from a content analysis of the AER. The development of the Program Success Index hinges upon the assumption that the AER is an accurate reflection of resident's performance. It is possible that these evaluations reflect the ability of the program mentor to accurately describe the resident's performance more than they reflect that performance itself. The perception of a resident's performance, as detailed in the AER and when viewed by selection

boards or even the expert reviewers in this study, can, thus, be biased by a mentor's skill and experience in writing AERs. As Guion and Gibson reported, performance ratings can also be biased by the personal relationship between the resident and the mentor (6). Even though these influences may effect the assessment of performance by reviewers of an AER, it is felt that the dimensions of success in AEGD uncovered in this study, would not be altered by this potential bias.

The issue of institutional variation must also be considered as a potential influence on the performance evaluation. Program mentors use program objectives of the ADA Commission on Accreditation as guidelines, but AEGD program objectives can still vary among training institutions due to differences in facilities and staffing, the experience and training of the mentor, and what has been done previously in the program. Success at any one institution then becomes a matter of how well a resident meets the objectives and expectations of that program, as viewed by the program director. Because program directors have no standardized objectives, they (currently there are six programs) can be very independent and the "institutional personality" that develops can cause success to be viewed very differently from program to program. If one assumes that residents and mentors (and their aptitudes) are nondifferentially assigned to the various training sites, and that training programs operate under the same general program objectives, then one could expect to see little or no difference in resident performance from program to program and from

year to year. The results of this study showed this to be true. Therefore, it can be concluded for this sample population, that, while the training programs may be very independent, "institutional personality" did not appear to influence success as viewed by the mentors.

Given the sample specific predictors identified in this study, we are reluctant to presume that the same factors would emerge with another non-military sample. The question of the universality of these factors notwithstanding, the primary value of the novel approach used in this study is in helping to further clarify the nature of success in AEGD through the development of the Program Success Index. It is suggested that the five dimensions of success uncovered in this study can serve as a framework for establishing evaluative criteria. The results suggest that while background factors used by selection committees can distinguish between levels of success in an AEGD program, other factors should be considered. Consideration of scores from the National Board Exams and Regional Dental Licensing Exams, in conjunction with traditional background information, might give more useful predictors of levels of success in the AEGD program.

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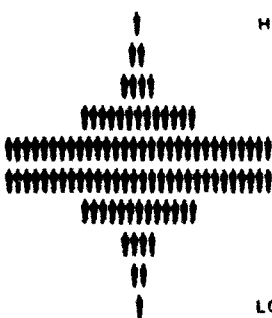
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APPENDIX A

PART I - ADMINISTRATIVE DATA												
a. LAST NAME FIRST NAME MIDDLE INITIAL				b. SSN		c. GRADE		d. DATE OF RANK <small>Year Month Day</small>			e. SR f. DESIGNATED SPECIALTIES	
i. UNIT ORGANIZATION, STATION, ZIP CODE OR APO, MAJOR COMMAND								j. REASON FOR SUBMISSION			k. COMD CODE	
l. PERIOD COVERED <small>FROM THRU</small> <small>Year Month Day Year Month Day</small>				m. NO OF MONTHS		n. MILPO CODE		o. RATED OFFICER COPY (Check one and date: <input type="checkbox"/> 1 GIVEN TO OFFICER <input type="checkbox"/> 2 FORWARDED TO OFFICER			p. FORWARDING ADDRESS	
q. EXPLANATION OF NONRATED PERIODS												
PART II - AUTHENTICATION (Rated officer signature verifies PART I data and RATING OFFICIALS ONLY)												
a. NAME OF RATER (Last, First, MI)				SSN		SIGNATURE <div style="border: 1px solid black; height: 20px; width: 100%;"></div>						
GRADE, BRANCH, ORGANIZATION, DUTY ASSIGNMENT										DATE		
b. NAME OF INTERMEDIATE RATER (Last, First, MI)				SSN		SIGNATURE <div style="border: 1px solid black; height: 20px; width: 100%;"></div>						
GRADE, BRANCH, ORGANIZATION, DUTY ASSIGNMENT										DATE		
c. NAME OF SENIOR RATER (Last, First, MI)				SSN		SIGNATURE <div style="border: 1px solid black; height: 20px; width: 100%;"></div>						
GRADE, BRANCH, ORGANIZATION, DUTY ASSIGNMENT										DATE		
d. SIGNATURE OF RATED OFFICER				DATE		e. DATE ENTERED ON DA FORM 21		f. RATED OFFICER MPO INITIALS		g. SR MPO INITIALS h. NO OF INCL		
PART III - DUTY DESCRIPTION (Rater)												
a. PRINCIPAL DUTY TITLE								b. SSI/MOS				
c. REFER TO PART IIIa, DA FORM 67-8-1												
PART IV - PERFORMANCE EVALUATION - PROFESSIONALISM (Rater)												
a. PROFESSIONAL COMPETENCE <small>(In Items 1 through 14 below indicate the degree of agreement with the following statements as being descriptive of the rated officer. Any comments will be reflected in b below.)</small>						<div style="display: flex; justify-content: space-between;"> HIGH DEGREE LOW DEGREE </div> <div style="display: flex; justify-content: space-between;"> 1 2 3 4 5 </div>						
1. Possesses capacity to acquire knowledge/grasp concepts						8. Displays sound judgment						
2. Demonstrates appropriate knowledge and expertise in assigned tasks						9. Seeks self-improvement						
3. Maintains appropriate level of physical fitness						10. Is adaptable to changing situations						
4. Motivates, challenges and develops subordinates						11. Sets and enforces high standards						
5. Performs under physical and mental stress						12. Possesses military bearing and appearance						
6. Encourages candor and frankness in subordinates						13. Supports EO/EEO						
7. Clear and concise in written communication						14. Clear and concise in oral communication						
b. PROFESSIONAL ETHICS (Comment on any area where the rated officer is particularly outstanding or needs improvement)												
<div style="display: flex;"> <div style="width: 15%; padding-right: 10px;"> 1. DEDICATION 2. RESPONSIBILITY 3. LOYALTY 4. DISCIPLINE 5. INTEGRITY 6. MORAL COURAGE 7. SELFLESSNESS 8. MORAL STANDARDS </div> <div style="width: 85%;"></div> </div>												

PERIOD COVERED _____	
PART V - PERFORMANCE AND POTENTIAL EVALUATION (Rater)	
a. RATED OFFICER'S NAME _____ SSN: _____ RATED OFFICER IS ASSIGNED IN ONE OF HIS/HER DESIGNATED SPECIALTIES/MOS: <input type="checkbox"/> YES <input type="checkbox"/> NO	
b. PERFORMANCE DURING THIS RATING PERIOD (REFER TO PART III DA FORM 67-B AND PART III a, b AND c DA FORM 67-B-1) <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> ALWAYS EXCEEDED REQUIREMENTS <input type="checkbox"/> USUALLY EXCEEDED REQUIREMENTS <input type="checkbox"/> MET REQUIREMENTS <input type="checkbox"/> OFTEN FAILED REQUIREMENTS <input type="checkbox"/> USUALLY FAILED REQUIREMENTS </div>	
c. COMMENT ON SPECIFIC ASPECTS OF THE PERFORMANCE (REFER TO PART III DA FORM 67-B AND PART III a, b AND c DA FORM 67-B-1. DO NOT USE FOR COMMENTS ON POTENTIAL)	
d. THIS OFFICER'S POTENTIAL FOR PROMOTION TO THE NEXT HIGHER GRADE IS <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> PROMOTE AHEAD OF CONTEMPORARIES <input type="checkbox"/> PROMOTE WITH CONTEMPORARIES <input type="checkbox"/> DO NOT PROMOTE <input type="checkbox"/> OTHER (Explain below) _____ </div>	
e. COMMENT ON POTENTIAL	
PART VI - INTERMEDIATE RATER	
a. COMMENTS	
PART VII - SENIOR RATER	
a. POTENTIAL EVALUATION (See Chapter 4, AR 621-105) <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;"> SR <div style="height: 100px; border-bottom: 1px solid black;"></div> </div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 2px; margin-left: 10px;"> DA USE ONLY <div style="display: flex;"> <div style="margin-right: 5px;">HI</div> <div style="height: 100px; border-bottom: 1px solid black;"></div> </div> <div style="display: flex;"> <div style="margin-right: 5px;">LO</div> <div style="height: 100px; border-bottom: 1px solid black;"></div> </div> </div> </div>	b. COMMENTS <div style="height: 150px;"></div>
A COMPLETED DA FORM 67-B-1 WAS RECEIVED WITH THIS REPORT AND CONSIDERED IN MY EVALUATION AND REVIEW <input type="checkbox"/> YES <input type="checkbox"/> NO (Explain in b) _____	

YEAR	GROUP	FY	ID NUMBER
1964	1	1	1
1964	1	2	2
1964	1	3	3
1964	1	4	4
1964	1	5	5
1964	1	6	6
1964	1	7	7
1964	1	8	8
1964	1	9	9
1964	1	10	10
1964	1	11	11
1964	1	12	12
1964	1	13	13
1964	1	14	14
1964	1	15	15
1964	1	16	16
1964	1	17	17
1964	1	18	18
1964	1	19	19
1964	1	20	20
1964	1	21	21
1964	1	22	22
1964	1	23	23
1964	1	24	24
1964	1	25	25
1964	1	26	26
1964	1	27	27
1964	1	28	28
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1964	1	30	30
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1964	1	91	91
1964	1	92	92
1964	1	93	93
1964	1	94	94
1964	1	95	95
1964	1	96	96
1964	1	97	97
1964	1	98	98
1964	1	99	99
1964	1	100	100

AGE AT GRADUATION FROM DENTAL SCHOOL

CLASS STANDING IN DENTAL SCHOOL OF

GRADE POINT AVERAGE BASED ON

SEX 1 MALE 2 FEMALE

DENTAL LICENSE 1 YES 2 NO

PRIOR SERVICE 1 OFFICER 2 ENLISTED 3 NONE

ROTC TRAINED 1 YES 2 NO

US MILITARY ACADEMY 1 YES 2 NO

PROMOTION TO MAJOR 1 BELOW THE ZONE 2 WITH PEERS 3 PASSED OVER

REGULAR ARMY 1 YES 2 NO

SELECTED FOR SPECIALTY TRAINING 1 YES 2 NO

MILITARY BASE FOR AEGD TRAINING

33

APPENDIX B

AEGD SUCCESS INDEX EVALUATION FORM

CASE#	POTENTIAL			RESIDENCY PERFORMANCE		TOTAL SCORE
	Institu.	Dent.	Ldrship	Requirements	Appraisal	
	0 1 2 3 4	0 1 2 3 4	0 1 2 3 4	0 = met 1 = met + 2 = met ++ 3 = met +++ 4 = met ++++	0 = aver. 1 = aver. 2 = ↑ aver. 3 = ↑↑ aver. 4 = superior	
001						
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24 April 1992

SUBJECT: Instruction sheet for AEGD Success Index Evaluation Form

1. Guidelines for the Evaluation

- a. The "Potential" category has three areas: 1) institutional, 2) dental, and 3) leadership. Use the following guides to help you score these areas:

	<u>Guidelines</u>	<u>Scoring</u>
<u>Institutional</u>	- professional bearing	4 - superior
		3 - far above peers
	- recommended advanced military schooling	2 - above peers
	- recommended for Voluntary Indefinite or Regular Army Appointment	1 - with peers
		0 - below peers
<u>Dentistry</u>	-recommended for specialty trning	4 - superior
		3 - far above peers
	-recommended for Officer in Charge of small/medium clinic	2 - above peers
		1 - with peers
		0 - below peers
<u>Leadership</u>	-recommended for leadership positions	4 - superior
		3 - far above peers
	-recommended for ↑ responsibility	2 - above peers
	-recommended for early promotion	1 - with peers
		0 - below peers

- c. The "Residency Performance" section has two areas: 1) an evaluation of how well the program requirements were met, and 2) a subjective appraisal of how well the resident performed based on the content of the written narrative. Use the following guides to help you score these areas:

	<u>Guidelines</u>	<u>Scoring</u>
<u>Requirements</u> <u>of Program</u>	Met ++++ (outstanding)	= 4
	Met +++ (always exceeds +)	= 3
	Met ++ (always exceeds)	= 2
	Met + (usually exceeds)	= 1
	Met	= 0
<u>Content</u> <u>Appraisal</u>	Average (superior)	= 4
	↑↑ Average	= 3
	↑ Average (Above)	= 2
	Average	= 1
	↓ Average	= 0

2. You do not have to total the scores, merely enter a number in each appropriate box.

TABLES

Table 1

**Reliability Estimates of Review Ratings
of AEGD Program Dimensions**

Dimension	Weighted Kappa	Percent Agreement
Institutional Potential	.55	.65
Leadership Potential	.72	.74
Dental Professional Potential	.80	.84
Academic Performance	.72	.75
Overall Residency Performance	.80	.82

Table 2
AEGD Success Criterion Measures

Dimension	Description	Mean	S.D.
1. Institutional Potential	Possesses institutional bearing, recommended for advanced institutional schooling.	2.38 ^a	0.80
2. Leadership Potential	Recommended for leadership positions, increased responsibility, and promotion ahead of peers.	2.30 ^a	0.91
3. Dental Professional Potential	Recommended for dental specialty training, recommended for supervisor of small or medium-sized dental clinic.	2.43 ^a	0.87
4. Academic Performance	Ability to meet program requirements, proficiency in clinical and didactic assignments.	2.33 ^b	0.86
5. Overall Residency Performance	Content appraisal of Officer Evaluation Report: outstanding, excellent, average, or below average.	2.38 ^b	0.89
6. Overall Success Score	Summation of 5 Dimensional Rating Scores	11.82	3.94

^a 0=below peers, 1=with peers, 2=above peers, 3=far above peers, 4=superior to peers

^b 0=far below average, 1=average, 2=above average, 3=far above average, 4=superior

Table 3

Principal Component Analysis
of Five Dimensions of AEGD Success

DIMENSION	PRINCIPAL COMPONENT				
	1	2	3	4	5
Institutional Potential	.40	.46	.56	.52	.21
Leadership Potential	.47	.55	-.63	-.23	.16
Dental Professional Potential	.43	-.63	-.35	.49	.23
Academic Performance	.44	-.30	.40	-.65	.36
Overall Residency Performance	.49	-.07	.08	-.05	-.86
Proportion of Variance	.83	.07	.04	.04	.02

Table 4
Potential Predictor of Variables Examined
by Year Groups

Variable	YEAR GROUP		
	YRGRP 84 n=33	YRGRP 86 n=24	YRGRP 87 n=33
GRADUATION AGE			
mean	26.9 years	29.3	27.3
(s.d.)	(2.75)	(3.63)	(2.32)
min,max	24,35	25,37	24,33
GENDER (%)			
-MALE	30 (91.0)	21 (87.5)	30 (91.0)
-FEMALE	3 (9.0)	3 (12.5)	3 (9.0)
CLASS RANK			
mean	Top 38%	Top 39%	Top 38%
(s.d.)	15%	18%	20%
min,max	7%,76%	7%,73%	3%,73%
DENTAL SCHOOL			
GPA			
mean	3.04	3.03	3.03
(s.d.)	0.22	0.26	0.37
min,max	2.60,3.50	2.6,3.5	2.4,3.8
PRIOR SERVICE (%)			
-Officer	4 (12.0)	8 (33.0)	3 (9.0)
-Enlisted	6 (18.0)	5 (15.0)	4 (12.0)
MILITARY SCHOOLING (%)			
ROTC	5 (15.0)	9 (37.5)	5 (15.2)
USMA	1 (3.0)	0 (0)	0 (0)
REGULAR ARMY (%)			
Appointment	8 (24.2)	3 (12.5)	1 (3.0)
TRAINING SITE (%)			
-Ft. Carson	4 (12.1)	2 (8.7)	6 (18.1)
-Ft. Campbell	0 (0.0)	0 (0.0)	7 (21.2)
-Ft. Jackson	8 (24.2)	4 (17.4)	7 (21.2)
-Ft. Benning	6 (18.2)	3 (13.1)	5 (15.2)
-Ft. Sill	6 (18.2)	7 (30.4)	5 (15.2)
-Ft. Riley	7 (21.2)	3 (13.0)	3 (9.1)
-Ft. Bragg	2 (6.1)	4 (17.4)	0 (0.0)

Table 5
Simple Correlations between Observed Variables

	1	2	3	4	5	6	7	8	9
1. Graduation Age	--	-.11	-.18	.16	-.05	-.21*	.11	.06	.06
2. Regular Army Appointment	-.11	--	.10	.18	.02	-.06	-.27*	.25*	.25*
3. Class Standing	-.18	.10	--	.17	.14	.44*	.02	.26*	.26*
4. Military Education	.16	.18	.17	--	.18	.13	.01	.23*	.23*
5. Gender	-.05	.02	.14	.18	--	.10	-.01	-.01	-.01
6. GPA	-.21*	-.06	.44*	.13	.10	--	-.02	.06	.06
7. Year Group	.11	-.27*	.02	.01	-.01	-.02	--	-.07	-.07
8. Program Success Score	.06	.25*	.26*	.23*	-.01	.06	-.07	--	.99*
9. Overall Success Score	.06	.25*	.26*	.23*	-.01	.06	-.07	.99*	--

* = significant at the $p = .05$ level.

Program Success Score = First principle component of 5 Dimensions of AEGD Success.

Overall Success Score = The sum of the 5 Dimensional rating scores.

Table 6
Regression of AEGD Success Index Score
on Identified Predictors
(n=90)

Variable	Parameter Estimate	Standard Error	Probability
INTERCEPT	1.911	4.225	.3261
OLDER MILITARY	-4.894	2.009	.0085
GRADUATION AGE	0.318	0.151	.0193
REGULAR ARMY APPOINTMENT	1.856	1.180	.0598
CLASS STANDING	1.966	0.864	.0127
PRIOR MILITARY EDUCATION	2.887	1.171	.0078

Model F value = 4.42, $P < .0013$, $R^2 = .2083$, (two-tailed test)

Older Military = interaction term combining prior military education with graduation age greater than 30 years. 1 if > 30 years old and prior military education; 0 if otherwise.

Graduation Age = Age at graduation from dental school.

Regular Army Appointment = 1 if regular army appointment; 0 if otherwise.

Class Standing = 1 if class rank is top 50%; 0 if class rank is bottom 50%.

Prior Military Education = 1 if ROTC or USMA; 0 if otherwise.

Table 7

EXAMPLES OF VALUES FOR AEGD SUCCESS INDEX EQUATION

MODEL EQUATION

$$\begin{aligned} \text{OVERALL SUCCESS SCORE} &= 1.911 - 4.894*(\text{OLDER MILITARY}) + 1.856*(\text{REGULAR ARMY}) + \\ &\quad 2.887*(\text{PRIOR MILITARY EDUCATION}) + .318*(\text{GRADUATION AGE}) \\ &\quad + 1.966*(\text{CLASS STANDING}) \end{aligned}$$

SCORE	95% CI*	OLDER MILITARY	REGULAR ARMY	MILITARY EDUC.	GRADUATION AGE	CLASS STANDING
9.54	8.07 11.04	0	0	0	24	0
9.86	8.59 11.15	0	0	0	25	0
11.83	10.21 13.47	0	0	0	25	1
12.75	10.34 15.18	0	0	1	25	0
15.03	12.71 17.38	0	0	1	26	1
16.89	14.33 19.46	0	1	1	26	1
12.09	10.47 13.73	0	0	0	32	0
12.05	9.09 15.03	1	0	1	32	1

* 95% CI represents the upper and lower confidence intervals for the predicted TOTAL scores.

RANGE OF TOTAL SCORES AND PERCENTILES

<u>TOTAL SCORES</u>		<u>PERCENTILE</u>
0.0 - 9.86	Bottom	10.0%
≤ 10.10		25.0%
≤ 11.45		50.0%
≤ 12.75		75.0%
≥ 14.64	Top	10.0%

Table 8

**Classification of AEGD Participants
Based on Probit Logistic Regression**

Original Group	Percent Correct	Number of Participants Classified as	
		Above Average Success	Below Average Success
Successful	68.6	35	16
Less than Successful	66.7	13	26
Total	67.8		

"Above Average" was defined as above the Overall Success Score mean of 11.83.

"Below Average" was defined as below the Overall Success Score mean of 11.83.